

Description

The CXA3741UR is a high-speed buffer amplifier IC with built-in switches.
(Applications: CCD image sensor output buffers, digital still cameras, camcorders, other general buffers)

Features

- ◆ Power consumption: 26 mW (typ.)
(IDRV = 50 μ A (220k Ω when V_{CC} = 15V), ISF current = 0, during no signal)
- ◆ Push-pull output
- ◆ High-speed response: 500 V/ μ s (IDRV = 50 μ A (220k Ω when V_{CC} = 15V), C_L = 20pF)
- ◆ Internal sink current mode for CCD source follower output. Settable by external resistance R_{ISF}
- ◆ Sink current and drive current with each built-in switch. Each current value can be set by an external resistance.

Structure

Bipolar silicon monolithic IC

Absolute Maximum Ratings

(T_a = 25 $^{\circ}$ C)

◆ Supply voltage	V_{CC}	16	V
◆ Input voltage	IN	GND – 0.3 to V_{CC} + 0.3	V
◆ Storage temperature	T_{stg}	–65 to +150	$^{\circ}$ C
◆ Allowable power dissipation	P_D	0.73	W

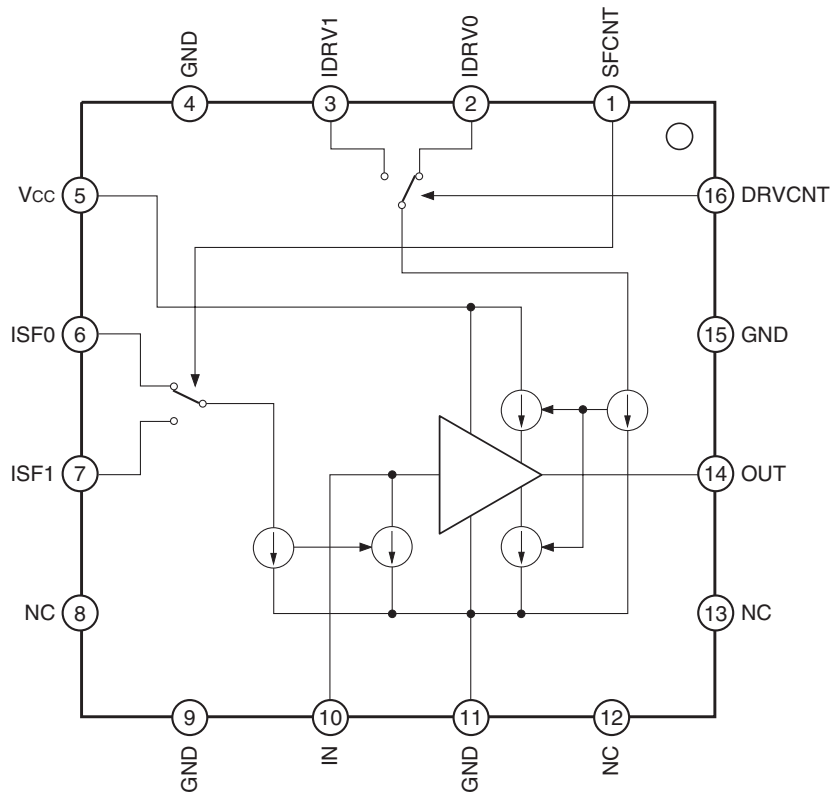
(when mounted on a two-layer board; 30mm \times 30mm, t = 0.8mm)

Recommended Operating Conditions

◆ Supply voltage	V_{CC}	9 to 15.5	V
◆ Operating temperature	T_a	–20 to +75	$^{\circ}$ C

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Block Diagram and Pin Description



Pin Description and I/O Pin Equivalent Circuit

Pin No.	Symbol	I/O	Standard voltage level	Equivalent circuit	Description
4	GND	—	0V	—	GND
5	Vcc	—	15V	—	Power supply
9	GND	—	0V	—	GND
11	GND	—	0V	—	GND
15	GND	—	0V	—	GND
1	SFCNT	I	CMOS		Switches the sink current setting for CCD with open source output. When the SFCNT pin (Pin 16) input logic is low, the sink current is set according to the current set by the ISF0 pin (Pin 6). When high, the sink current is set according to the current set by the ISF1 pin (Pin 7).
16	DRVCNT	I	CMOS		Switches the drive current setting. When the DRVCNT pin (Pin 16) input logic is low, the drive current is set according to the current set by the IDRV0 pin (Pin 2). When high, the drive current is set according to the current set by the IDRV1 pin (Pin 3).
2	IDRV0	I	—		External resistor connection for setting the drive current. Connect external resistors between these pins and Vcc (Pin 5). When not using this function, connect these pins to GND. *The minimum value for external resistors should be 100kΩ (when Vcc is 15V).
3	IDRV1	I	—		

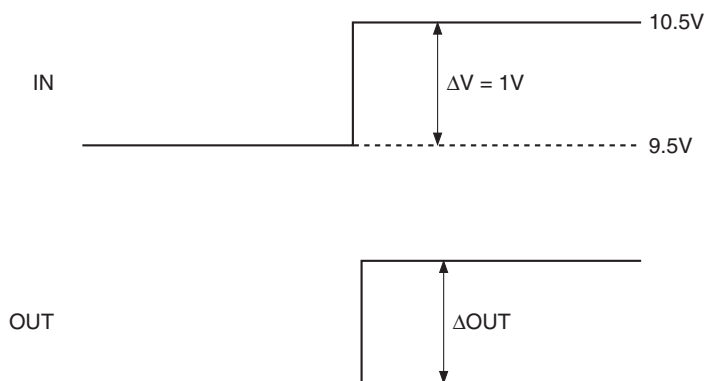
Pin No.	Symbol	I/O	Standard voltage level	Equivalent circuit	Description
6	ISF0	I	—		<p>External resistor connection for setting the CCD with open source output sink current. Connect external resistors between these pins and Vcc (Pin 5). When not using this function, connect these pins to GND. *The minimum value for external resistors should be 100kΩ (when Vcc is 15V).</p>
7	ISF1	I	—		
10	IN	I	CCD output voltage		Input
14	OUT	O	≈IN		Output

Electrical Characteristics

(Ta = 25°C, VCC = 15V, RIDRV0 = 220kΩ, RIDRV1 = 470kΩ, ISF0 and ISF1 pins: connected to GND)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Supply current	ICC	IN = 10V, RDRV0 = 220kΩ, RDRV1 = 470kΩ DRVCNT = 0V	1.5	1.7	1.9	mA
Voltage gain	VGAIN	*1 IN: F10Vdc ΔV = 1V GAIN = ΔOUT/ΔV	—	0.999	—	V/V
I/O offset voltage	VOFFSET	IN = 10V VOFFSET = OUT-IN	-100	—	100	mV
I/O voltage range	VRANGE	RIDRV = 100kΩ RIDRV = 150kΩ RIDRV = 220kΩ RIDRV = 330kΩ	3.3 2.9 2.5 2.1	— — — —	VCC - 2.0 VCC - 1.85 VCC - 1.8 VCC - 1.7	V
Input bias current	IBIAS	IN = 10V, ISF0, 1 = 0V, IDRV0, 1 = 220kΩ	-6.0	3.0	20	μA
		IN = 10V, ISF0, 1, IDRVO, 1 = 0V	3.0	9.0	15	μA
Sink current	ISINK	IN = 10V, RISF0 = 220kΩ, RISF1 = 470kΩ SFCNT = 0V	2.6	2.9	3.2	mA
Switch control voltage "High"	VcontH	VDD = 3.0 ± 0.3V	2.025	—	—	V
Switch control voltage "Low"	VcontL		—	—	0.825	V

*1 Voltage gain

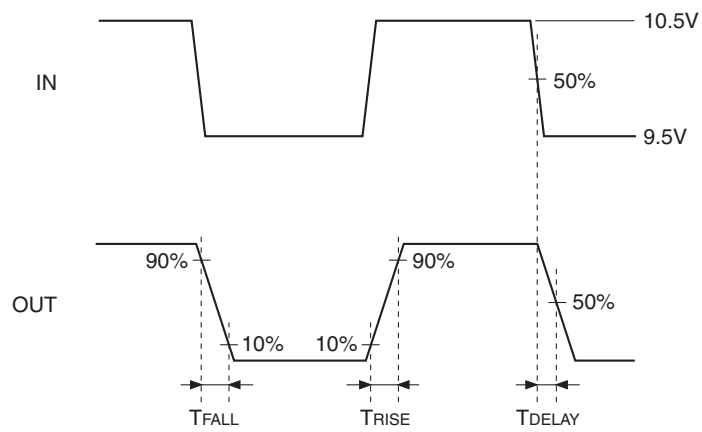


AC Characteristics

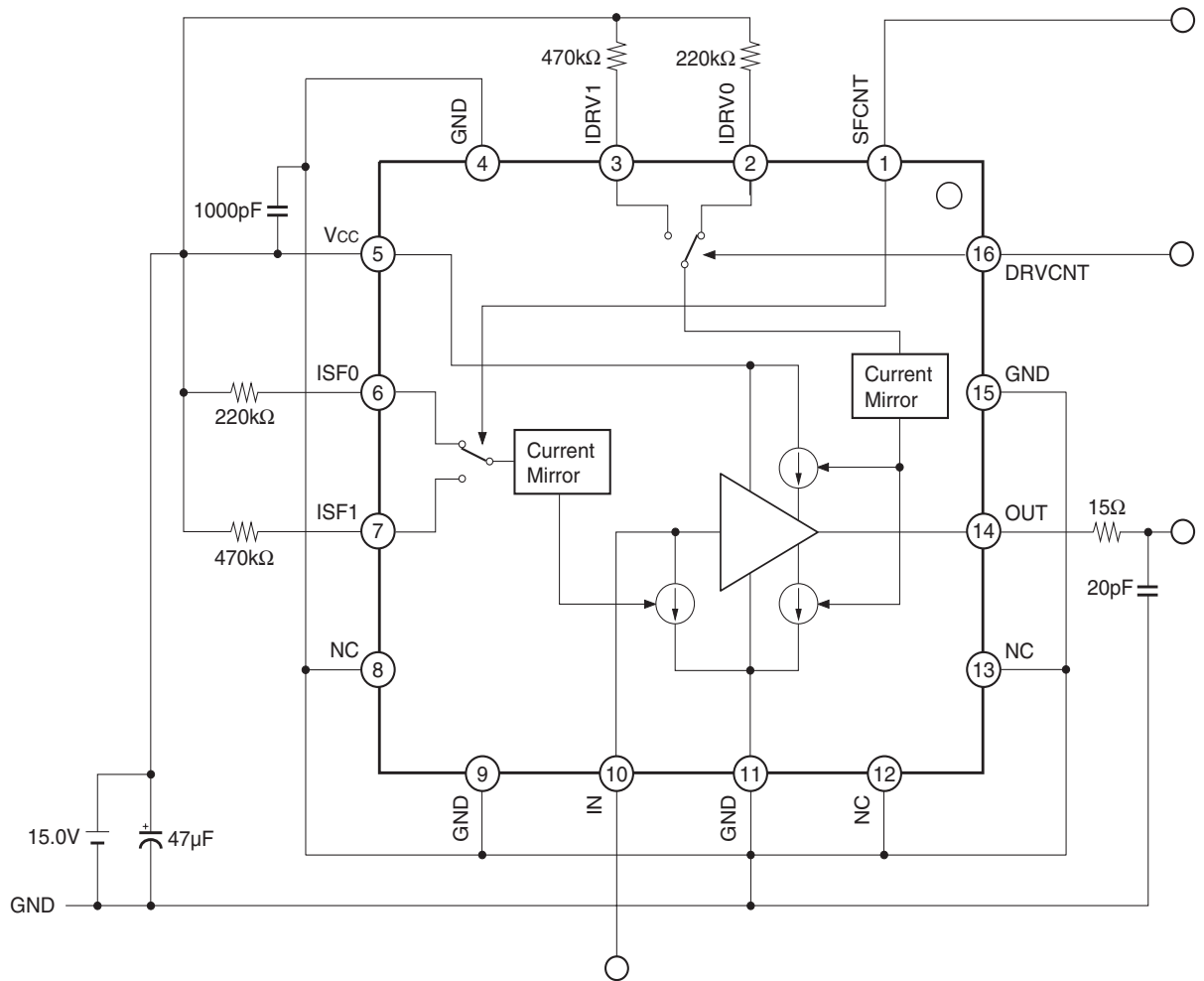
($T_a = 25^\circ\text{C}$, $I_{DRV} = 50\mu\text{A}$ (220k Ω when $V_{CC} = 15\text{V}$), ISF0 and ISF1 pins: connected to GND, $R_L = 15\Omega$, $C_L = 20\text{pF}$)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Unit
Bandwidth	GBW	IN = 50mVp-p	—	220	—	MHz
Rise time	T_{RISE}	*1 IN = 9.5 to 10.5V 10 to 90%	—	2.5	3.5	ns
Fall time	T_{FALL}	*1 IN = 10.5 to 9.5V 10 to 90%	—	3.0	4.0	ns
I/O delay time	T_{DELAY}	*1 IN = 9.5 to 10.5V @50%	0.9	1.0	2.0	ns

*1 Rise time, fall time and I/O delay time



Evaluation Circuit



Description of Operation

Current Settings

1. Output Drive Current

The small signal output impedance of the OUT pin (Pin 14) can be set by connecting the IDRVO pin (Pin 2) or the IDRVI pin (Pin 3) to V_{CC} through a resistor.

The inflow current to the IDRV pin is multiplied by 10 times inside the IC, and flows as the output stage idling current.

The IDRV pins have internal 50kΩ resistors.

When the drive current setting switching pin DRVCNT (Pin 16) input logic is low, the inflow current to the IDRV pin is set according to the current set by the IDRVO pin (Pin 2).

When high, the inflow current to the IDRV pin is set according to the current set by the IDRVI pin (Pin 3). The above-mentioned inflow current to the IDRV pin can be calculated as follows.

$$\begin{aligned} I_{IDRV} &= (V_{CC} - V_{BE} \times 2) / (R_{IDRV} + 50k\Omega) \\ &= (15 - 1.46) / 270k\Omega \\ &= 50.1\mu A \end{aligned}$$

Here, V_{CC} = 15V, V_{BE} = 0.73V (typ.), and R_{IDRV} = 220kΩ.

The small signal output impedance at this time can be calculated as follows.

$$\begin{aligned} R_{OUT} &= (26mV / (10 \times I_{IDRV})) / 2 \\ &= (26mV / 501\mu A) / 2 \\ &= 26\Omega \end{aligned}$$

2. Sink Current for CCD with Open Source Output

The sink current of the IN pin (Pin 10) can be set by connecting the ISF0 pin (Pin 6) or the ISF1 pin (Pin 7) to V_{CC} through a resistor.

This sink current can be used as the CCD output stage source follower drive current.

The inflow current to the ISF pin is multiplied by 58 times inside the IC, and flows as the sink current.

The ISF pins have internal 50kΩ resistors.

When the CCD source follower output sink current setting switching pin SFCNT (Pin 1) input logic is low, the inflow current to the ISF pin is set according to the current set by the ISF0 pin (Pin 6).

When high, the inflow current to the ISF pin is set according to the current set by the ISF1 pin (Pin 7).

The above-mentioned inflow current to the ISF pin can be calculated as follows.

$$\begin{aligned} I_{ISF} &= (V_{CC} - V_{BE} \times 2) / (R_{ISF} + 50k\Omega) \\ &= (15 - 1.46) / 270k\Omega \\ &= 50.1\mu A \end{aligned}$$

Here, V_{CC} = 15V, V_{BE} = 0.73V (typ.), and R_{ISF} = 220kΩ.

The sink current at this time can be calculated as follows.

$$\begin{aligned} I_{sink} &= 58 \times I_{ISF} \\ &= 2.9mA \end{aligned}$$

Note) This IC operation depends on IDRVI and ISF.

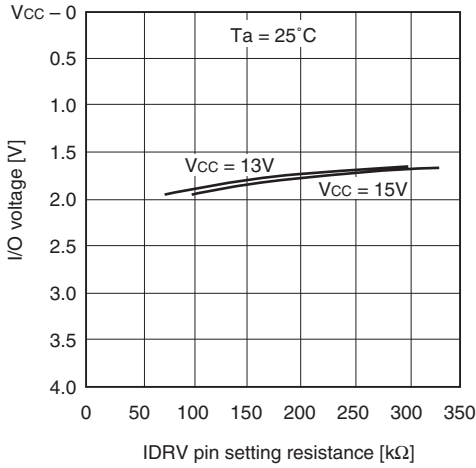
This specification is described based on IDRVI of 220kΩ when V_{CC} = 15V. However, set it to 180kΩ to occur the same current when using under the condition that V_{CC} = 13V.

[IDRV and ISF vs external resistor]

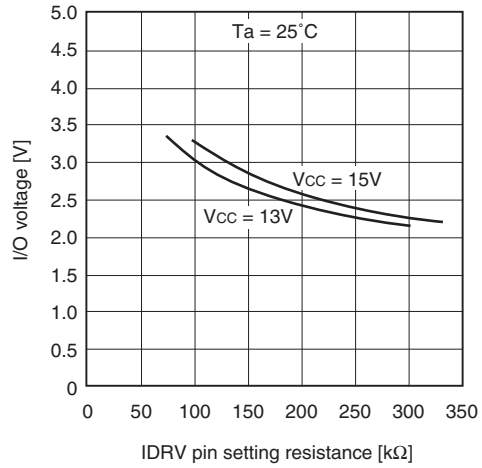
Current (μA)	90	68	50	35	26	Unit
When V _{CC} = 15V	100	150	220	330	470	kΩ
When V _{CC} = 13V	78	120	180	270	390	kΩ

Example of Representative Characteristics

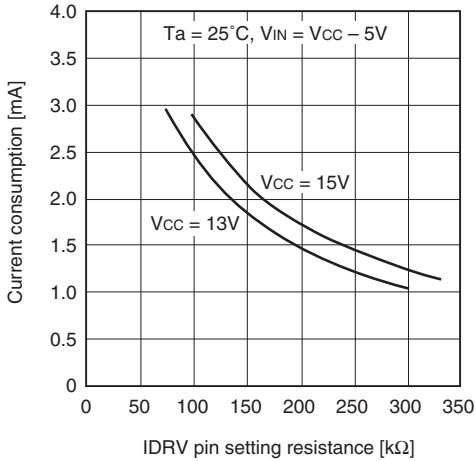
(Upper side) I/O voltage range vs. IDR pin setting resistance



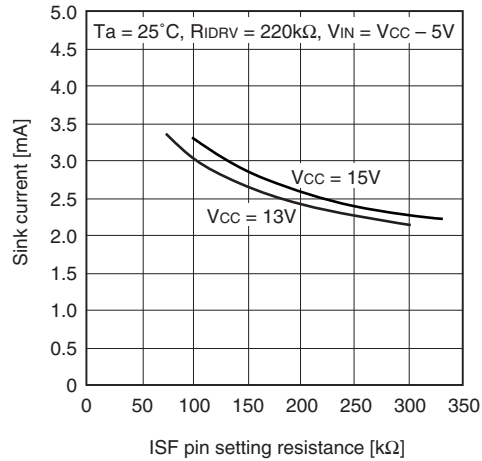
(Lower side) I/O voltage range vs. IDR pin setting resistance



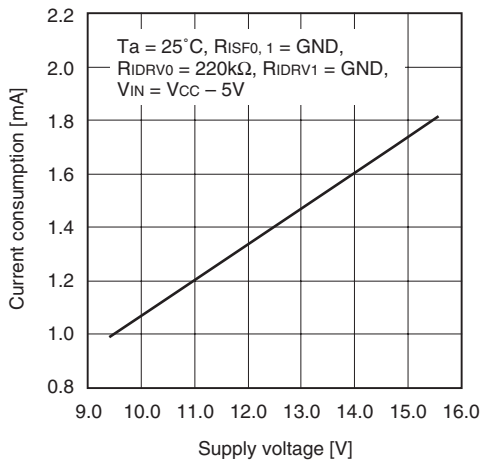
Current consumption vs. IDR pin setting resistance



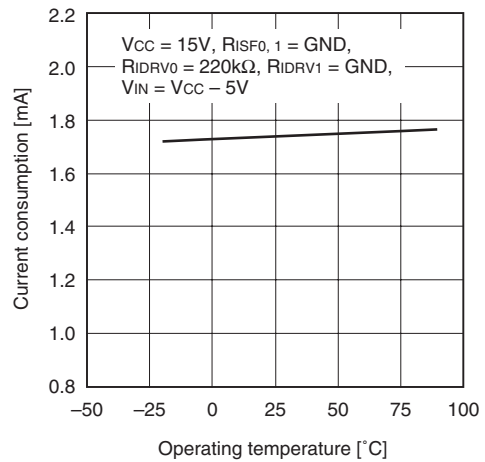
Sink current vs. ISF pin setting resistance

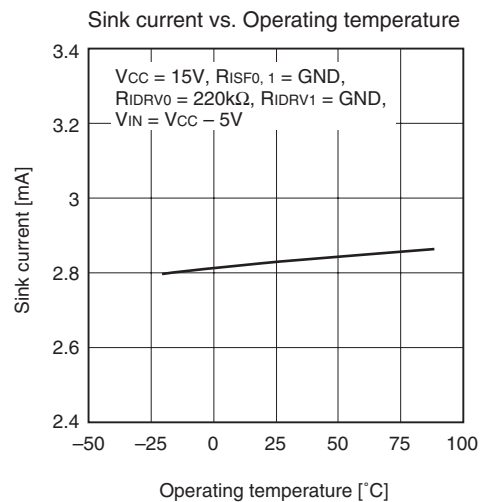
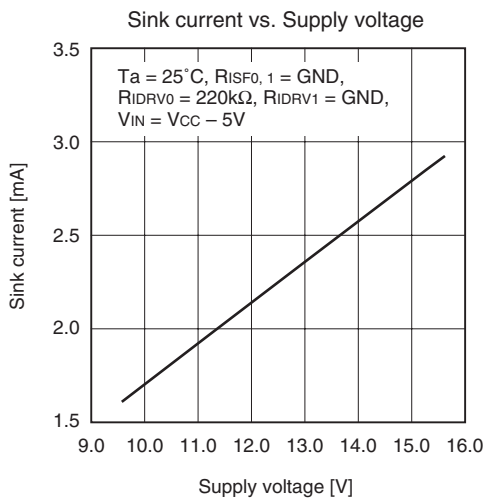
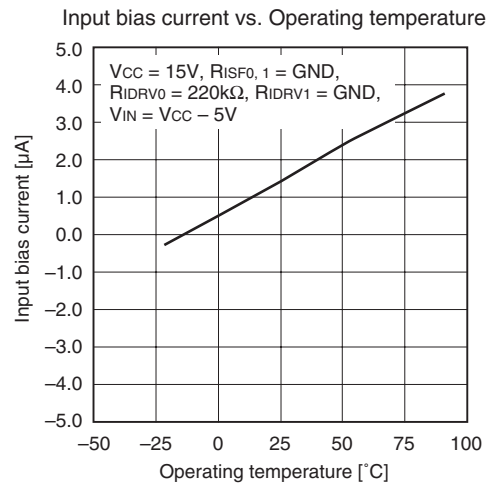
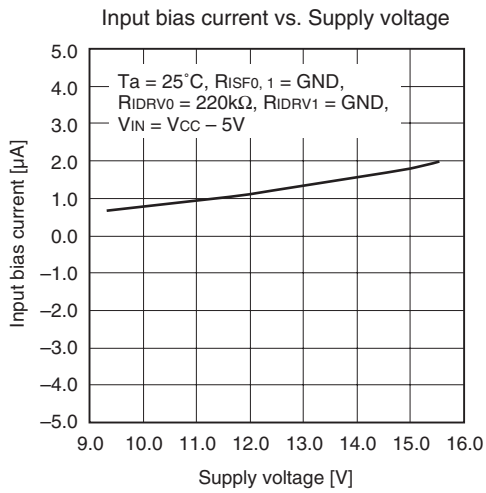
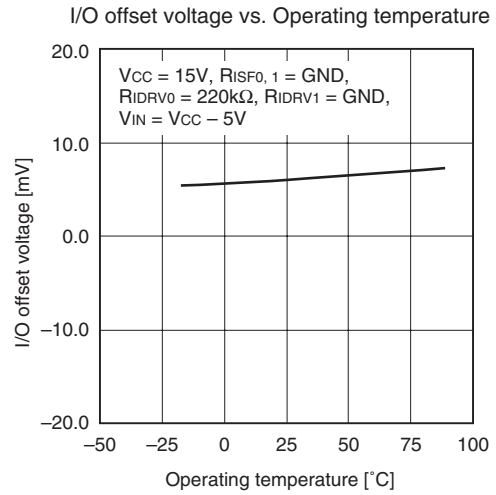
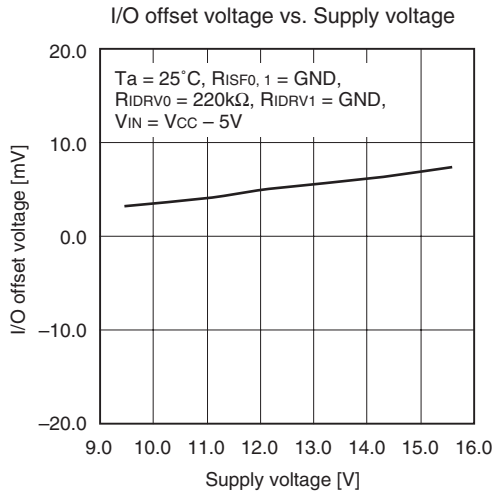


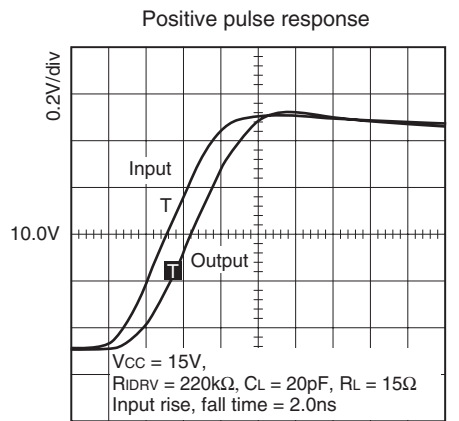
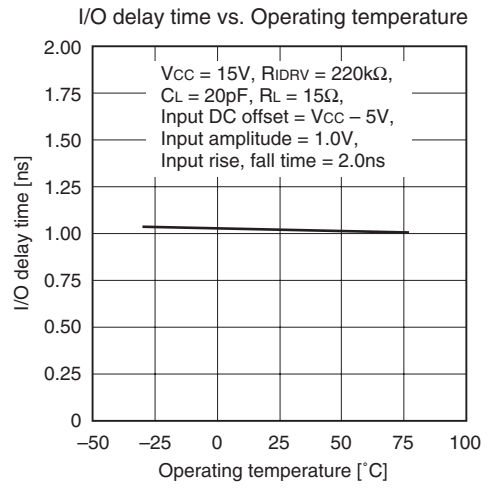
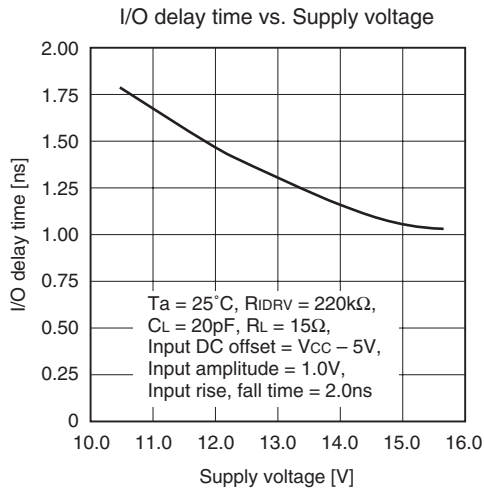
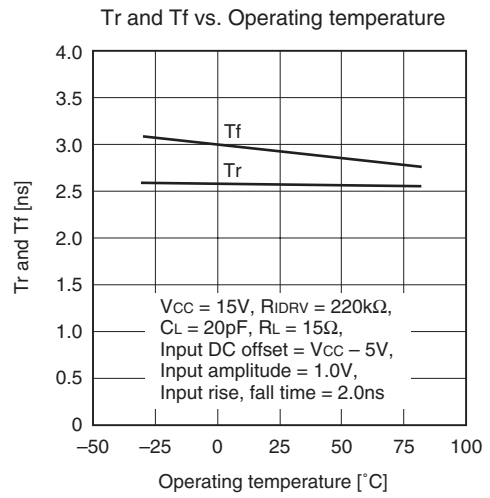
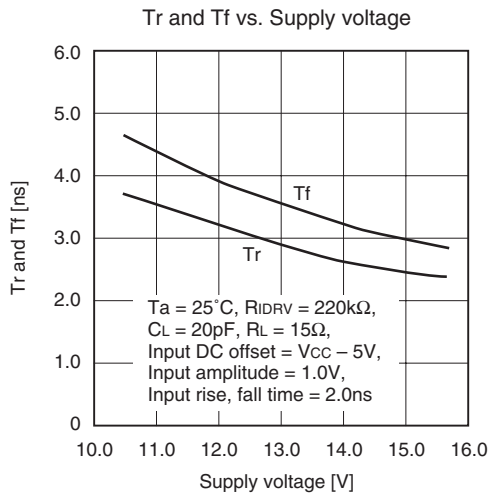
Current consumption vs. Supply voltage



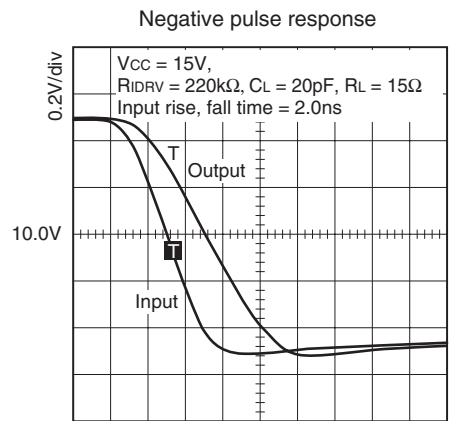
Current consumption vs. Operating temperature





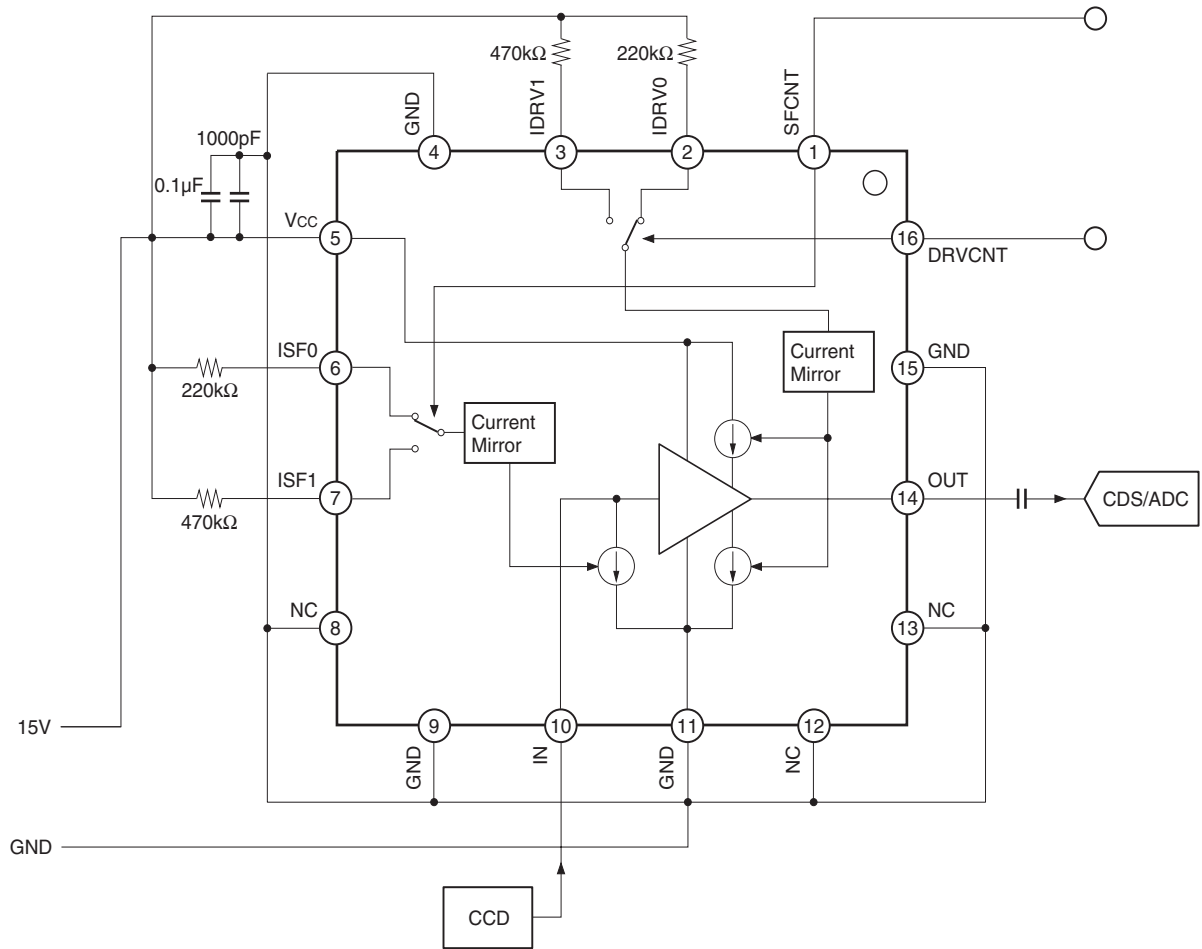


Ch1 200mV/div Ch2 200mV/div M 1.00ns Ch1\ 10.0V 1.0ns/div



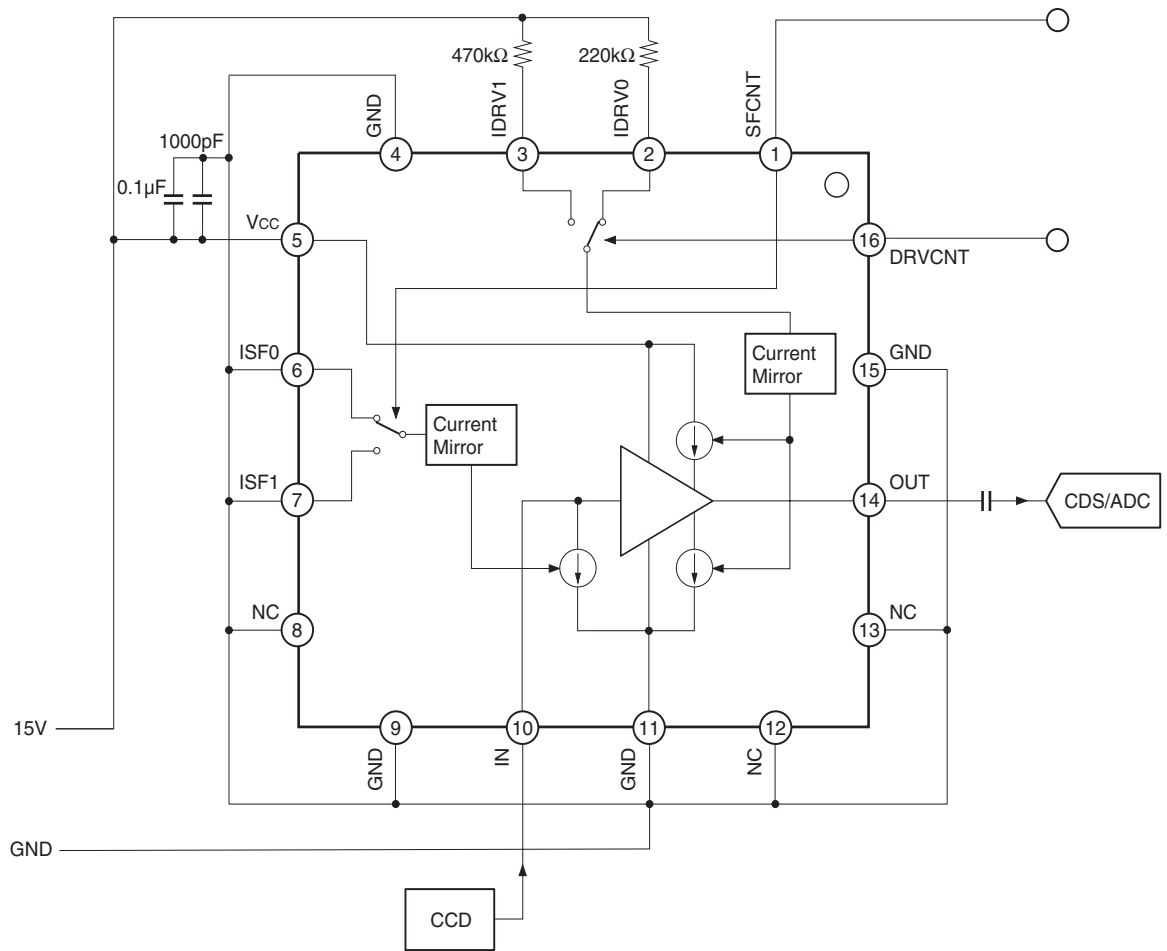
Ch1 200mV/div Ch2 200mV/div M 1.00ns Ch1\ 10.0V 1.0ns/div

Application Circuit 1 (when using CCD with open source output)



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Application Circuit 2 (when using CCD with internal current source)



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Notes On Handling

- ◆ Provide the widest GND pattern possible on the board.
- ◆ Use a 1000pF (recommended) ceramic capacitor and a 0.1 μ F (recommended) ceramic capacitor in parallel for the bypass capacitor connected between the power supply and GND, and connect them as close to the IC pins as possible.
- ◆ Load capacitance causes the input/output wiring response to worsen and results in noise. Use the short wiring layout, and shield it with GND.
- ◆ When the output pin (Pin 14) is shorted to either the power supply or GND, an overcurrent may flow to the IC and damage it.
- ◆ When the input pin (Pin 10) is shorted to GND, an overcurrent may flow to the internal parasitic elements and damage them.

